CERTIFICATION STATEMENT - 300 Sulfuric – Permit Modification Application

ADDITIONAL INFORMATION – DECEMBER 2007

RECEIVED

DEC 2 1 2007

Department of Environmental Quality
State Air Program

FACILITY INFORMATION

Facility/Permittee Name: J.R. Simplot Company – Don Plant

Facility Location: 1150 W. Highway 30, Pocatello, Idaho

AIRS Facility No.:   077-00006

Facility Contact: Kirk Adkins   **Ph:**   208-234-5470   **Fax:**   208-234-5305

PERMIT INFORMATION

Tier I Operating Permit No.:   T1-040313   **Issuance Date:**   11/08/2005

Certification of Truth, Accuracy, and Completeness (by Responsible Official)
I hereby certify that based on information and belief formed after reasonable inquiry, the statements and information contained in this and any attached and/or referenced document(s) are true, accurate, and complete in accordance with IDAPA 58.01.01.123-124.

_____   Plant Manager   12-12-07
Responsible Official Signature   *Responsible Official Title*   *Date*

John Bob
Print or Type Responsible Official Name

AgriBusiness

FedEx 5834 3958 6727

December 10, 2007

Mike Simon
Air Quality Program Manager
Idaho Department of Environmental Quality
1410 N. Hilton
Boise, ID 83706-1255

RE: Facility ID No. 077-00006, J.R. Simplot Company, Pocatello, Idaho
        Facility Draft Permit to Construct – No. P-060317 for Applicant Review

The J.R. Simplot Company, Don Plant received Facility Draft Permit to Construct – No. P-060317 for Applicant Review on October 17, 2006. Our comments on specific draft PTC conditions were submitted to your attention in a letter dated October 26, 2006. Of particular concern was Condition 2.10 - <u>Continuous Emissions Monitoring - Demonstration of Compliance with the SO_2 pound per hour and ton per year limits.</u> As articulated in our October 26th comment letter, Simplot objects to the newly imposed requirements utilizing stack flow rate monitoring in conjunction with CEMS to determine compliance with applicable lb/hr and ton/yr SO_2 limitations. This monitoring approach has been shown to produce biased results, between 7 and 10 percent higher than CEMS/mass balance generated estimates approved under NSPS subpart H. The monitoring prescribed in the draft PTC will effectively constrain production in the No. 300 Sulfuric Acid Plant below current levels and below the level required to ensure compliance with applicable lb/hr and ton/yr SO_2 limitations based on technically sound and accurate mass balance.

As a follow-up to our October 26th comments and subsequent communications with DEQ, Simplot contracted RTP Environmental Associates, Inc. to assist in a further review of the draft PTC prescribed monitoring and available options to address both Simplot concerns and DEQ compliance assurance objectives. A memorandum from RTP Environmental Associates, Inc. to Simplot is enclosed. This letter and the RTP memorandum supplement our previous comments with regard to SO_2 emissions monitoring from the No. 300 Sulfuric Acid Plant, providing additional analysis of available monitoring approaches and proposed procedures that address the identified flow monitoring bias and provide for continuous compliance assurance with applicable lb/hr and ton/yr emissions limitations.

If you have any questions contact me at (208) 234-5470 or Bob Willey at (208) 234-5352.

Sincerely,

Kirk Adkins
Environmental Manager
J.R. Simplot Company
Don Plant

304-A West Millbrook Road
Raleigh North Carolina 27609
(919) 845-1422

RECEIVED

DEC 21 2007

Department of Environmental Quality
State Air Program

Memorandum

To: Kirk Adkins, Environmental Manager - J.R. Simplot Company Don Plant

From: Peter Keller

Copy: Bob Willey, Simplot

Date: July 10, 2007

Re: Review of Monitoring Requirements - J.R. Simplot Company, Pocatello, Idaho Facility
Draft Permit to Construct No. P-060317 for Applicant Review

The J.R. Simplot Company, Don Plant received Facility Draft Permit to Construct – No. P-060317 for Applicant Review on October 17, 2006. Comments on specific draft PTC conditions were submitted IDEQ in a letter dated October 26, 2006. Of particular concern was Condition 2.10 - <u>Continuous Emissions Monitoring - Demonstration of Compliance with the SO_2 pound per hour and ton per year limits.</u> Simplot contracted RTP Environmental Associates, Inc. (RTP) to assist in a further review of the draft PTC prescribed monitoring and available options to address both Simplot concerns and DEQ compliance assurance objectives.   This memorandum documents RTP's findings and conclusions.

<u>Background</u>
The J.R. Simplot Company Don Plant is a phosphate fertilizer manufacturing plant that operates two sulfuric acid plants, the No. 300 Sulfuric Acid Plant and No. 400 Sulfuric Acid Plant. Both sulfuric acid plants are subject to NSPS subpart H – Standards of Performance for Sulfuric Acid Plants (40 CFR 60.80 – 85). The NSPS standard for SO_2 emissions is 4 pounds per ton of 100% sulfuric acid produced, with excess emissions defined on a three-hour rolling average basis. The NSPS requires a CEMS for measuring SO_2 concentration in the exhaust gases. Two methods for determining emissions in units consistent with the standard (i.e., lb/ton) are provided in 40 CFR 60.84. The mass balance-based approach provided by §60.84(d) has historically been used by Simplot for determining compliance with both NSPS and PTC emission limits.

A new PTC was issued for the No. 300 Sulfuric Acid Plant in June 2001, restricting SO_2 emissions to 170 lb/hr (3-hour rolling average) and 750 tons/yr (12-month rolling total).[1] The 2001 PTC also contained a production limit of 1,750 tons of 100% sulfuric acid per day (24-hour rolling average). The initial compliance test for the 2001 PTC indicated that SO_2 emissions were significantly less than indicated in the permit application. In June 2006 Simplot submitted a PTC modification application requesting, among other things, removal of the 1,750 ton/day production limit for the No. 300 Sulfuric Acid Plant. Draft PTC No. P-060317 was completed for facility review on October 6, 2006. The SO_2 monitoring requirements contained in the October 2006 draft PTC are the subject of this memorandum.

---

[1] Permit to Construct P-000318 for No. 300 Sulfuric Acid Plant restoration project; June 15, 2001.

Draft PTC SO₂ Monitoring Provisions

Condition 2.10 of the draft PTC requires use of the SO_2 CEMS in conjunction with a flow rate monitoring system to determine SO_2 mass emission rates. This approach represents a significant departure from current monitoring requirements, which rely upon periodic source testing and production rate monitoring. It is well understood that EPA Method 2 and continuous stack gas velocity and volumetric flow measurement systems are subject to bias (i.e., overestimate volumetric flow) in situations where pitch and yaw angles and wall effects are a factor. This fact has been acknowledged by EPA and underlies both the promulgation of alternative monitoring and testing procedures under NSPS subpart H (addressed in detail below) and the recent promulgation of three new optional testing procedures, Methods 2F, 2G, and 2H, for application under the Acid Rain Program. In the preamble to the 1999 direct final rule promulgating alternative Methods 2F, 2G, and 2H, EPA summarized the Method 2 flow measurement issues as follows:[2]

> *"Method 2 does not include procedures for measuring the yaw or pitch angles of flow or wall effects in calculating stack or duct gas velocity or volumetric flow rate. Volumetric flow rate is calculated by multiplying the average flue gas velocity by the stack or duct cross-sectional area. Yaw and pitch characterize the extent to which flue gas is not flowing straight out of a stack or duct. From the standpoint of a tester facing a vertical stack, a yaw angle is represented by flow movement to the left or right of the stack centerline. The pitch angle is represented by flow movement toward or away from the tester. The term "wall effects" refers to the drop-off of flue gas velocity near the inside wall of a stack or duct. This velocity drop-off is caused by friction from the stack wall... Yaw and pitch angles produce flue gas flow that swirls and/or bounces off stack or duct walls (total velocity). Only the straight-up (axial velocity) component of total velocity actually exits the stack. Moreover, determining axial velocity without accounting for the drop-off near the stack or duct wall can result in overstating the actual axial velocity. Thus, when enough yaw, pitch or wall effects are present, Method 2 can overstate the measured flue gas velocities (and thus volumetric flow) because it only allows the total velocity to be measured and does not account for yaw angles, pitch angles, or wall effects. If the test method overstates flow rate, a flow rate monitor calibrated using the test method may also overstate flow rate and result in overstated sulfur dioxide emissions and heat input."*

Method 2 flow rate test results for the No. 300 Sulfuric Acid Plant have shown a 7 to 10 percent positive bias in comparison to mass balance estimates, confirming the issues described above. The existing flow monitoring system on the No. 300 Sulfuric Acid Plant is associated with a now obsolete 1976 SIP requirement. Alternative test methods 2F, 2G, and 2H could be used to determine volumetric flow rate and calibrate a continuous flow monitoring system, however these procedures would be costly and burdensome. Given the availability of the NSPS mass balance approach for determining SO_2 emissions from the process without the need for continuous flow monitoring, the monitoring approach contained in the draft PTC does not seem warranted. Furthermore, Simplot is not aware of any other sulfuric acid plants that are required to monitor mass emissions using the continuous emission rate monitoring approach contained in the draft PTC.

---

[2] See 64 FR 26485; May 14, 1999.

NSPS Mass Balance Approach

NSPS subpart H was revised in 1983 to incorporate alternative monitoring and testing provisions for SO_2 and H_2SO_4 based on a sulfur mass balance of the process.[3] The No. 3 Sulfuric Acid Plant qualifies for use of the alternative procedures in 40 CFR 60.84(d) and 60.85(c)(1) because it processes elemental sulfur and uses air to supply oxygen. The procedures involve continuous monitoring of SO_2 and O_2 concentrations in the exhaust gas and conversion to the units of the standard (lb/ton) using the following equation:

$$E_s = (C_s \times S)/[0.265\text{-}(0.126 \times \%O_2)\text{-}(A \times \%CO_2)]$$

where:

E_s = emission rate of SO_2, kg/metric ton (lb/ton) of 100 percent of H_2SO_4 produced.
C_s = concentration of SO_2, kg/dscm (lb/dscf).
S   = acid production rate factor, 368 dscm/metric ton (11,800 dscf/ton) of 100 percent H_2SO_4produced.
$\%O_2$ = oxygen concentration in the exhaust gas, percent dry basis.
A   = auxiliary fuel factor,
        = 0.00 for no fuel (applicable to Simplot).
$\%CO_2$ = carbon dioxide concentration in the exhaust gas, percent dry basis.

The following excerpts from the 1982 preamble to the proposed NSPS revision and the final rule describe the basis for the alternative method:

> *"The alternative procedure is based on a sulfur mass balance determination of the sulfuric acid production process. It is accurate to the accuracy level of the measurements. The revision is appropriate for the applicable plants as it provides a means of reducing the testing requirements without loss of emissions data." [FR 47 31012; July 16, 1982]*

> *"This procedure is not required, but is an alternative that would alleviate problems encountered in the measurement of gas velocities or production rate." [40 CFR 60.48(d)]*

RTP contacted the EPA lead for the 1983 NSPS revisions, Mr. Roger Shigahara, and confirmed the intent behind the alternative method and the technical validity of the mass balance approach.[4] Additionally, RTP identified a technical publication documenting the derivation of the mass balance approach adopted by EPA.[5] The derivation of the equation contained in 40 CFR 60.84(d) is summarized below.

A stack gas flow factor, S, was derived from mass balance calculations such that emissions (lb/ton) could be calculated without directly measuring volumetric flow rate. The approach is

---

[3] See FR 47 31012; July 16, 1982 (proposal) and FR 48 44700; September 29, 1983 (final rule).
[4] Telephone contact: Peter Keller, RTP Environmental Associates, Inc. with Roger Shigehara, Vice President, Emissions Monitoring Inc., Raleigh, NC. January 9, 2006.
[5] "Production Rate Measurement in Sulfuric Acid Plants – A New Approach" by D. James Grove and Walter S. Smith, Entropy Environmentalists, Inc.; Stack Sampling News, January 1977.

similar to, but more accurate than the f-factor approach used to determine emissions in lb/MMBtu from combustion sources under NSPS (40 CFR 60) and the Acid Rain Program (40 CFR 72 – 78).
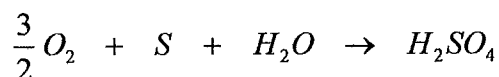
$$E = cS$$

where:

E = emission rate of SO_2 (or H_2SO_4), lbs/ton
c = concentration of SO_2 (or H_2SO_4), lbs/scf
S = stack gas flow factor, scf/ton

The following equation represents the overall chemical reaction that occurs in the production of sulfuric acid from elemental sulfur:

$$\frac{3}{2}O_2 \;+\; S \;+\; H_2O \;\rightarrow\; H_2SO_4$$

When air is used as the source of oxygen in the above reaction, a fixed ratio of inert nitrogen is added to the process. Since virtually all of the sulfuric acid product is removed from the exhaust gas, it is possible to directly calculate the amount of stack gas that is generated for a given mass of sulfuric acid production. The mass balance equations for this calculation are presented below:

$$\text{flow rate of } N_2 \text{ in exhaust gas} = Q\left(\frac{100 - \%O_2}{100}\right)$$

$$\text{flow rate of } O_2 \text{ at inlet} = Q\left(\frac{0.208 \; cf \; O_2}{0.792 \; cf \; N_2}\right)\left(\frac{100 - \%O_2}{100}\right)$$

$$\text{flow rate of } O_2 \text{ in exhaust} = Q\left(\frac{\%O_2}{100}\right)$$

$$\text{flow rate of } O_2 \text{ reacted} = Q\left[\left(\frac{0.208}{0.792}\right)\left(\frac{100 - \%O_2}{100}\right) - \left(\frac{\%O_2}{100}\right)\right]$$

Since 1 mole of sulfuric acid is produced for every 1.5 moles of oxygen consumed, the production rate of sulfuric acid is related to the amount of oxygen reacted as follows:

$$P = Q\left[\left(\frac{0.208}{0.792}\right)\left(\frac{100 - \%O_2}{100}\right) - \left(\frac{\%O_2}{100}\right)\right]\left(\frac{1 \; lbmol}{385 \; scf}\right)\left(\frac{2 \; mol \; SO_3}{3 \; mol \; O_2}\right)\left(\frac{98 \; lbs}{lbmol}\right)\left(\frac{ton}{2000 \; lbs}\right)$$

Rearranging the above equation yields the stack gas flow factor, S (i.e., the ratio of stack gas to sulfuric acid production in standard cubic feet of dry stack gas per ton of sulfuric acid produced):

$$S = \frac{Q}{P} = \frac{11,800}{0.263 - 0.0126\,\%O_2} \quad \frac{scf}{ton}$$

where:

Q = flow rate of exhaust gas, scfh
P = acid production rate, tph

The stack gas flow factor S is a function only of the stack gas oxygen content and it is derived directly from the chemical reaction material balance and the ratio of O_2 to N_2 in the atmosphere. Therefore, only the stack O_2 and SO_2 concentration need be measured to determine emissions in lbs/ton of H_2SO_4 produced. Since the H_2SO_4 production rate of the plant is accurately measured and recorded, mass emissions can be calculated as lbs/ton × tons/hr = lbs/hr.

Combination of Mass Balance and CEMS to Determine Emissions
In reviewing this situation, it is possible to have a calculation methodology for SO_2 emissions from the No. 300 Sulfuric Acid Plant based on the SO_2 and O_2 CEMS data, the NSPS mass balance calculation provided under 40 CFR 60.84(d), and sulfuric acid production rate monitoring that will demonstrate compliance on a continuous basis with applicable lb/hr and ton/yr emissions limitations. This proposed approach, outlined below, is more rigorous than the monitoring being performed under the current Tier I permit and that proposed by Simplot in their October 26, 2006 comment letter. We believe this approach satisfies the requirements of IDAPA 58.01.01.211 and 322.06 while addressing the concerns with continuous flow rate monitoring. The proposed monitoring approach is outlined below.

- Install, calibrate, maintain, and operate CEMS with automated data acquisition and handling system for measuring and recording SO_2 and O_2 concentrations;
- Operate CEMS in accordance with 40 CFR 60.13, 40 CFR 60 Appendix B, and QA procedures of 40 CFR 60 Appendix F;
- Monitor and record sulfuric acid production rate in tons 100% H_2SO_4 per hour;
- Calculate and record SO_2 emissions in pounds per ton of 100% H_2SO_4 in accordance with 40 CFR 60.84(d);
- Calculate and record hourly, three-hour average SO_2 emissions in pounds per hour as the product of pounds of SO_2 per ton of 100% H_2SO_4 and tons of 100% H_2SO_4 produced (arithmetic average of the proceeding three-hour period);
- Calculate and record monthly, twelve-month rolling total SO_2 emissions in tons per year as the sum of the current month emissions and the preceding 11 month total emissions.